CLINICAL VIGNETTE

Pregnancy and Sleep-Disordered Breathing

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Case Presentation

Our patient is a 35-year-old G2P1 female who presents at 7.5 months gestation with snoring and witnessed apneas which have increased in frequency compared to pre-pregnancy.

Her sleep schedule is a regular bedtime at around 2100 without sleep onset insomnia and a regular time of awakening at 0645. She reports frequent brief sleep disturbances 3 times per night to urinate and is usually able to fall back asleep. She takes a daily nap for 10-30 minutes, which has increased from her pre-pregnancy frequency of once a week.

Telehealth video exam includes body mass index (BMI) 29 kg/m^2, Epworth Sleepiness Scale 20/24, STOP BANG 3/8: snoring, tiredness and witnessed apnea. A home sleep apnea test (HSAT) was scheduled and revealed Apnea Hypopnea Index (AHI) 91/hr, Respiratory Disturbance Index 91/hr, Oxygen nadir 64% from baseline 91%, Evaluation time: 8:01, and Total Sleep Time 7:29.

She was diagnosed with severe obstructive sleep apnea (OSA) with nocturnal hypoxemia. Immediate treatment with positive airway pressure (PAP) therapy was recommended and a device was ordered. The device was received 3 weeks from her sleep study. She was able to initiate treatment for 2.5 weeks before her scheduled delivery and reported immediate resolution of her daytime sleepiness. Other benefits included reduced nighttime awakenings, improvement of reflux and resolution of snoring. She now only awakens secondary to her baby.

At a follow-up visit her sleep schedule was the following: Bedtime: 2300-0030, Nighttime awakenings 2-3x due to baby only, Wake up: 0545, no naps. She was consistently using her PAP with residual AHI of 2/hr. She also completed nocturnal oximetry with PAP which demonstrated resolution of the nocturnal hypoxemia.

Discussion

There are many physiological changes that occur during pregnancy. With respect to respiration and breathing, these changes predispose pregnant patients to an increased risk of developing a sleep-related breathing disorder. In pregnancy, tidal volume (TV) and minute ventilation (MV) increase while functional residual capacity (FRC) decreases.[1] These findings are predominantly attributed to elevation of the diaphragm from an enlarged uterus, elevated progesterone levels stimulating the medullary respiratory centers, and elevated estrogen levels increasing edema and inflammation of mucosal membranes. Additionally, a weight gain of about 20% of starting body weight also occurs in a relatively short period of time. Izci et al. found that snoring was more common in pregnant patients compared to nonpregnant patients.[2] Furthermore, pregnant patients in the third trimester of pregnancy tended to have smaller upper airways compared to nonpregnant and postpartum patients in supine, seated, and lateral positions. All these physiological changes warrant special attention in pregnant patients and their risk for sleep-disordered breathing.

Our case highlights the importance of screening pregnant patients for sleep-disordered breathing. Pregnancy symptoms may be similar to those from obstructive sleep apnea. Excessive daytime sleepiness, exhibited in our patient, can be seen in normal pregnancy. Maasilta et al., examined risk for sleep-disordered breathing in obese (BMI>30) pregnant patients compared to pregnant patients of normal weight.[3] They reported more patients in the obese group developed sleep-disordered breathing compared to controls. Of note, it was pre-pregnancy BMI, not amount of pregnancy weight gain which was associated. Higher risk for developing OSA was suggested even at first trimester with AHI of 1.7/hr and 0.2/hr for obese and control groups. The sleep characteristics of both groups were similar: both slept more in first trimester, all patients had less rapid eye movement (REM) and deep sleep in third trimester, and all slept less in supine position. In the third trimester, AHI was 2.6/hr and 0.1/hr for obese and control groups. This suggests that the risk for sleep disordered breathing is increased in the obese and risk increases across the trimesters of pregnancy. Pien et al., reported 10.5% of study patients had OSA in the first trimester, and 26.7% having the diagnosis by third trimester.[4] In another study Louis et al., reported factors commonly associated with sleep-disordered breathing in pregnancy: greater maternal age; greater BMI and frequent snoring (defined as ≥ 3 times a week).[5]

OSA is characterized by intermittent episodes of hypoxia during obstructive respiratory events which occur throughout the night. When this occurs in a pregnant patient, the potential consequences affect not only the mother but can have short- and long-term health consequences for the fetus. In pregnant rats, intermittent hypoxia has been associated with impaired fetal growth, and low birthweight compared to the offspring of mothers not exposed to hypoxia.[6] Also, a study by Ni et al.,

examined hypoxic burden in pregnant women and neonates. They found that a hypoxic burden (total area under the respiratory even related desaturation curve) > 6%min was associated with higher risk of preeclampsia.[6] Those with hypoxia burden >11.8%min were associated with higher incidence of gestational diabetes and Apgar scores <7 at 1 minute. The mechanism behind the development of pre-eclampsia has been suggested by Ni et al., to be triggered by hypoxia leading to a cascade of inflammatory injury, leading to dysfunction of the blood vessels and ultimately elevated blood pressure.[6] This process can take place at the placenta with vasoconstriction leading to restricted nutrient and oxygen supply to the fetus. For gestational diabetes the trigger of intermittent hypoxia causes inflammation, reduced insulin secretion, activation of the hypothalamic-pituitary-adrenal axis increasing corticosteroids and leading to insulin resistance.

Gestational sleep-disordered breathing is present for a limited period and therefore time to diagnosis and therapy is crucial. Given the potential health consequences such as low birth rate, pre-eclampsia, and gestational diabetes, which have long term health associations, it is important to consider sleep disordered breathing in pregnant patients who report increased snoring, with elevated BMI, and who are at advanced maternal age. In our patient, we chose to diagnose with a HSAT as she was already at 7.5 gestational months and rapid diagnosis was essential. She was able to get her PAP device and use therapy effectively for 2.5 weeks prior to delivery of a healthy baby. We will obtain another HSAT after she finishes losing her postpartum weight.

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